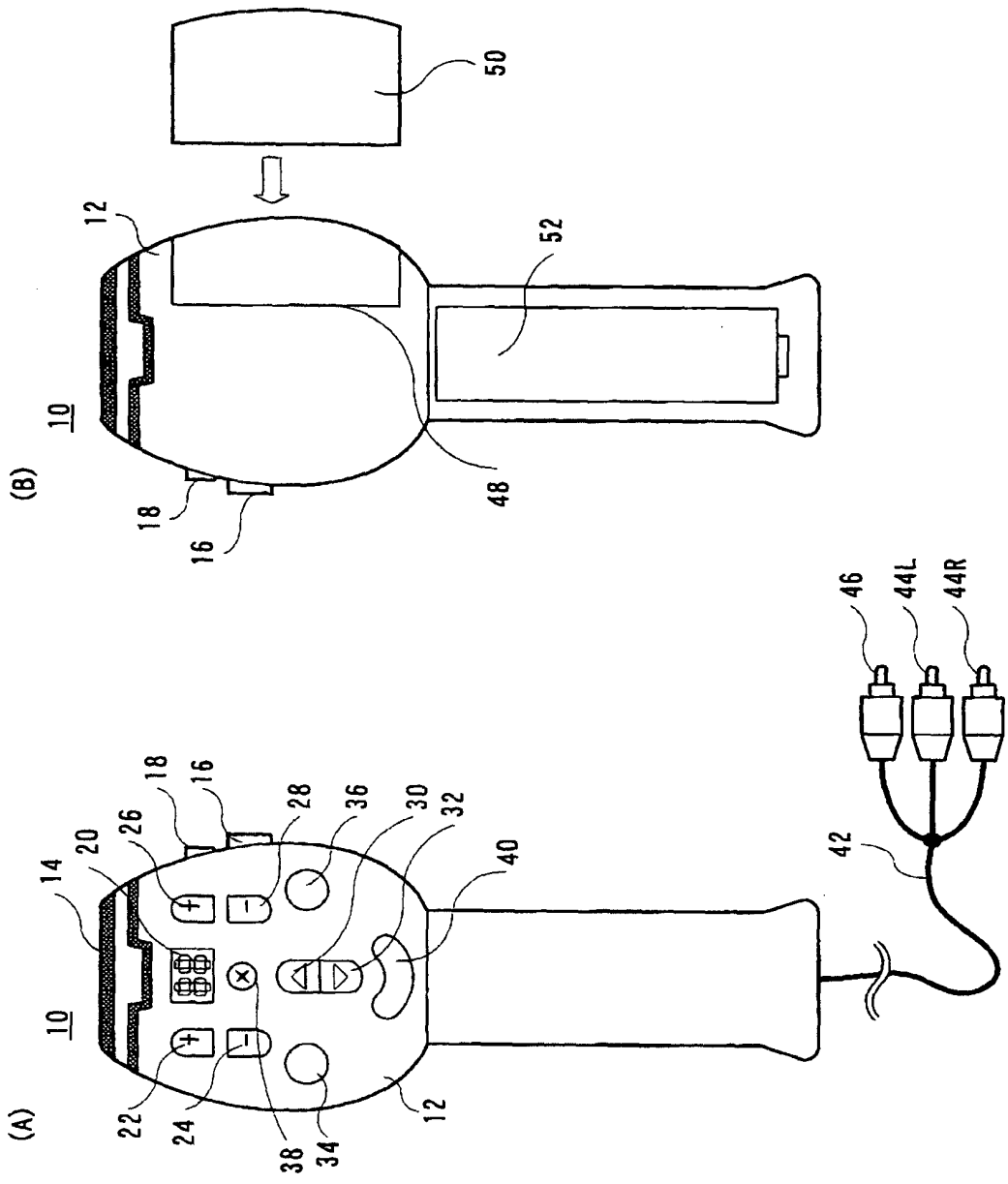

(A)
(B)
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44L
44R
46
48
50
52

FIG. 1

FIG. 2

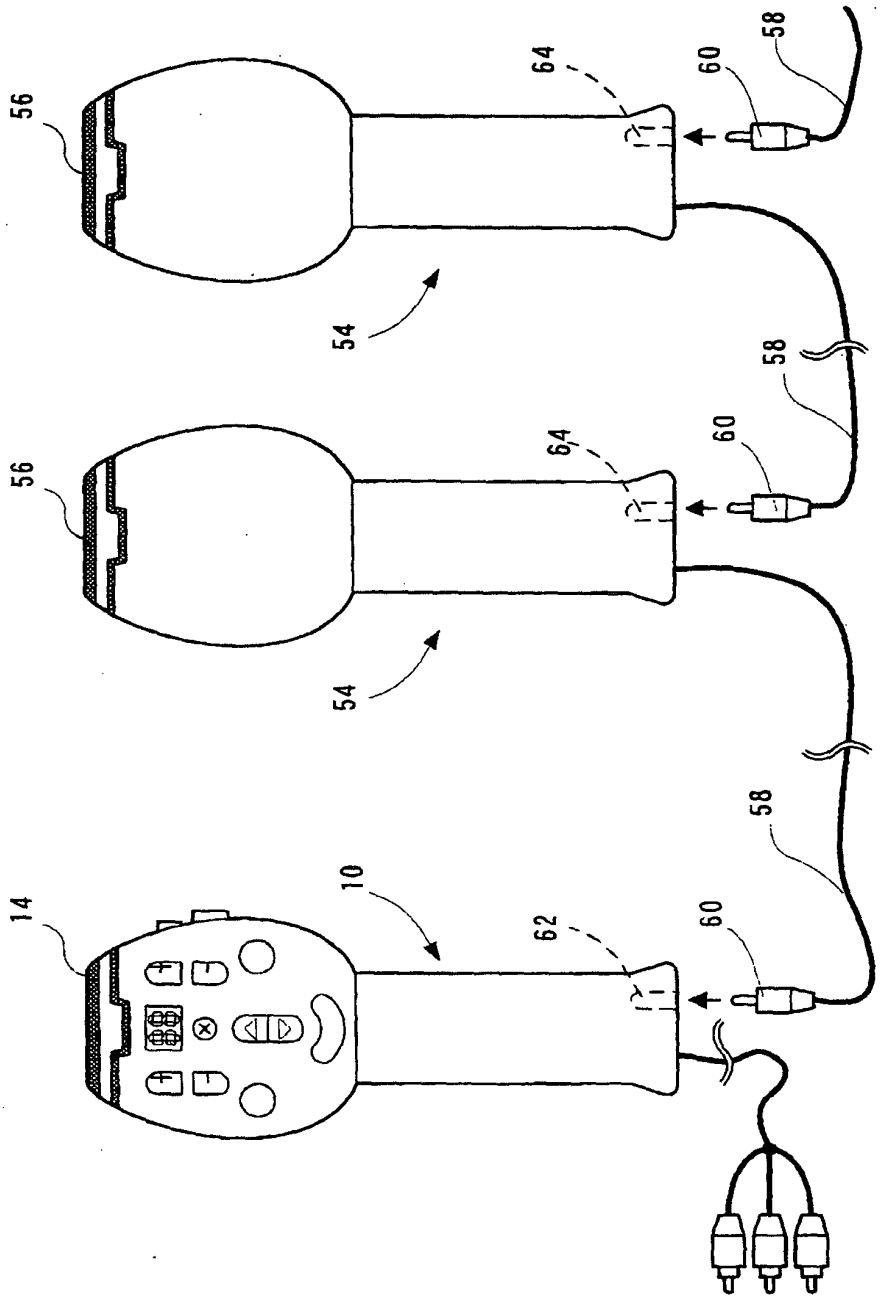


FIG. 3

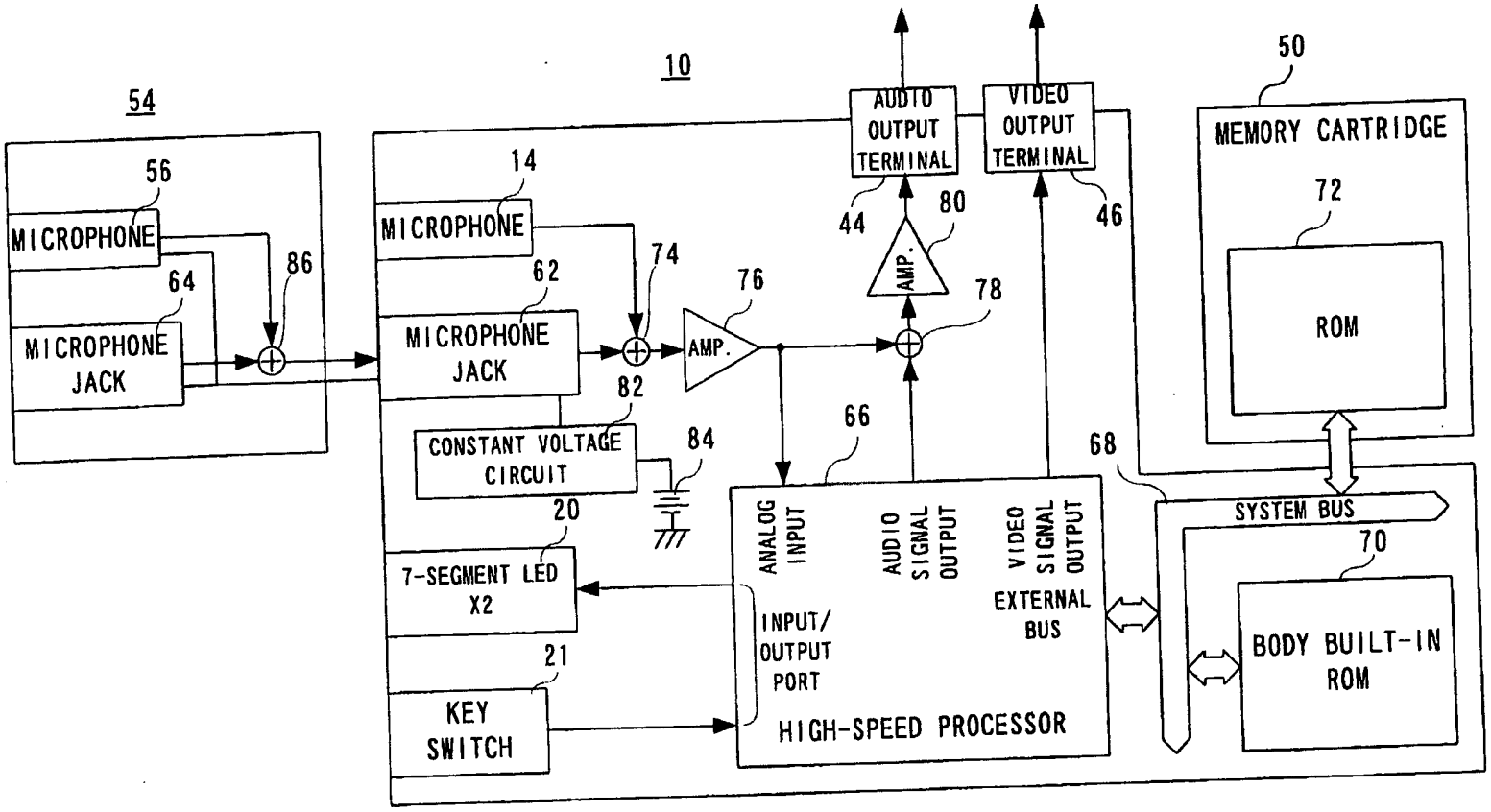

54
10
50
56
MICROPHONE
64
MICROPHONE JACK
86
14
MICROPHONE
62
MICROPHONE JACK
74
76
AMP.
82
CONSTANT VOLTAGE CIRCUIT
84
20
7-SEGMENT LED X2
21
KEY SWITCH
AUDIO OUTPUT TERMINAL
VIDEO OUTPUT TERMINAL
44
46
80
AMP.
78
66
68
ANALOG INPUT
AUDIO SIGNAL OUTPUT
VIDEO SIGNAL OUTPUT
INPUT/ OUTPUT PORT
EXTERNAL BUS
HIGH-SPEED PROCESSOR
MEMORY CARTRIDGE
72
ROM
SYSTEM BUS
70
BODY BUILT-IN ROM

FIG. 4

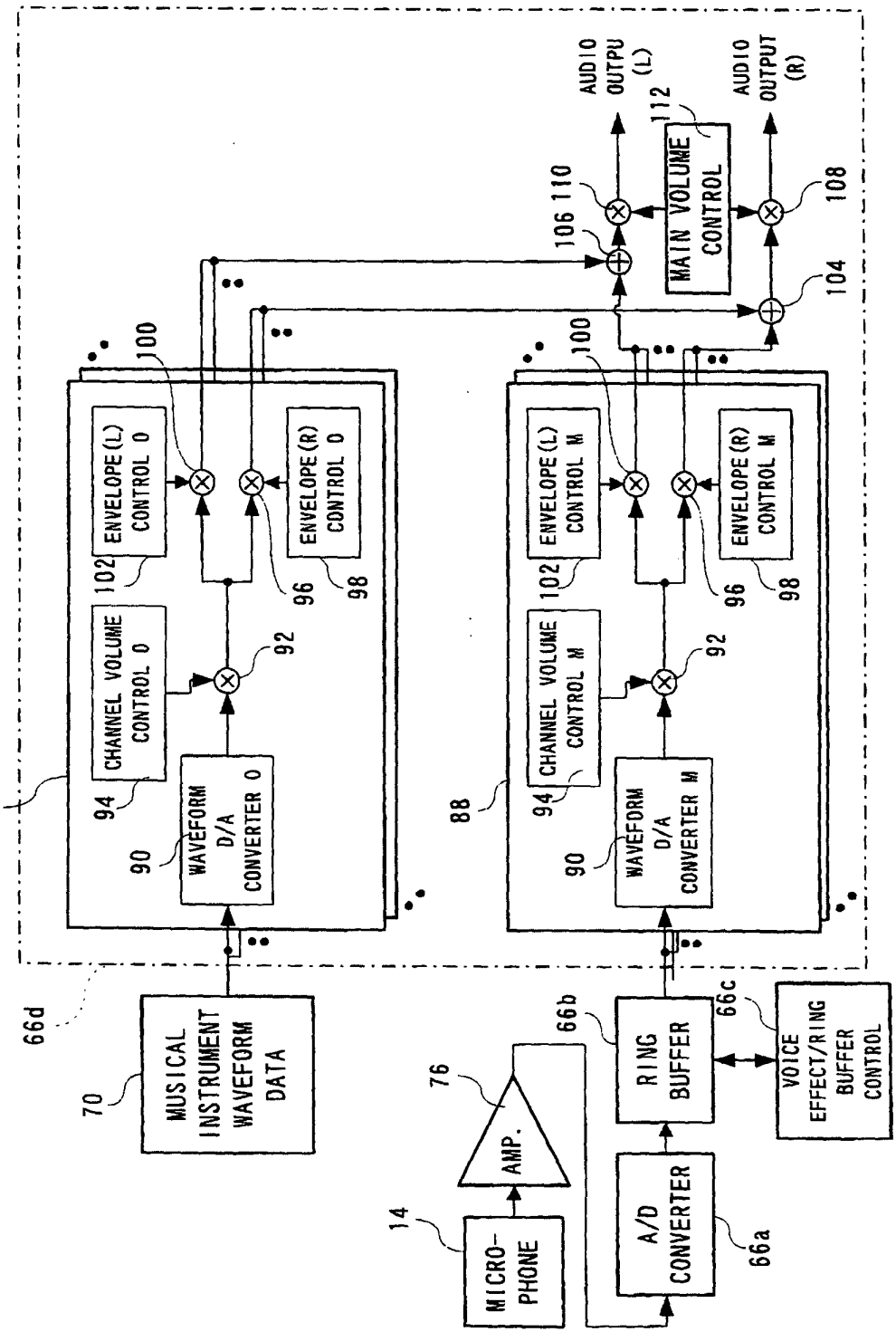

MICRO-PHONE
14
AMP.
76
A/D CONVERTER
66a
RING BUFFER
66b
VOICE EFFECT/RING BUFFER CONTROL
66c
MUSICAL INSTRUMENT WAVEFORM DATA
70
66d
88
WAVEFORM D/A CONVERTER 0
90
CHANNEL VOLUME CONTROL 0
94
92
ENVELOPE(L) CONTROL 0
102
ENVELOPE(R) CONTROL 0
98
96
100
WAVEFORM D/A CONVERTER M
CHANNEL VOLUME CONTROL M
ENVELOPE(L) CONTROL M
ENVELOPE(R) CONTROL M
MAIN VOLUME CONTROL
112
104
106
110
108
AUDIO OUTPUT (L)
AUDIO OUTPUT (R)

FIG. 5

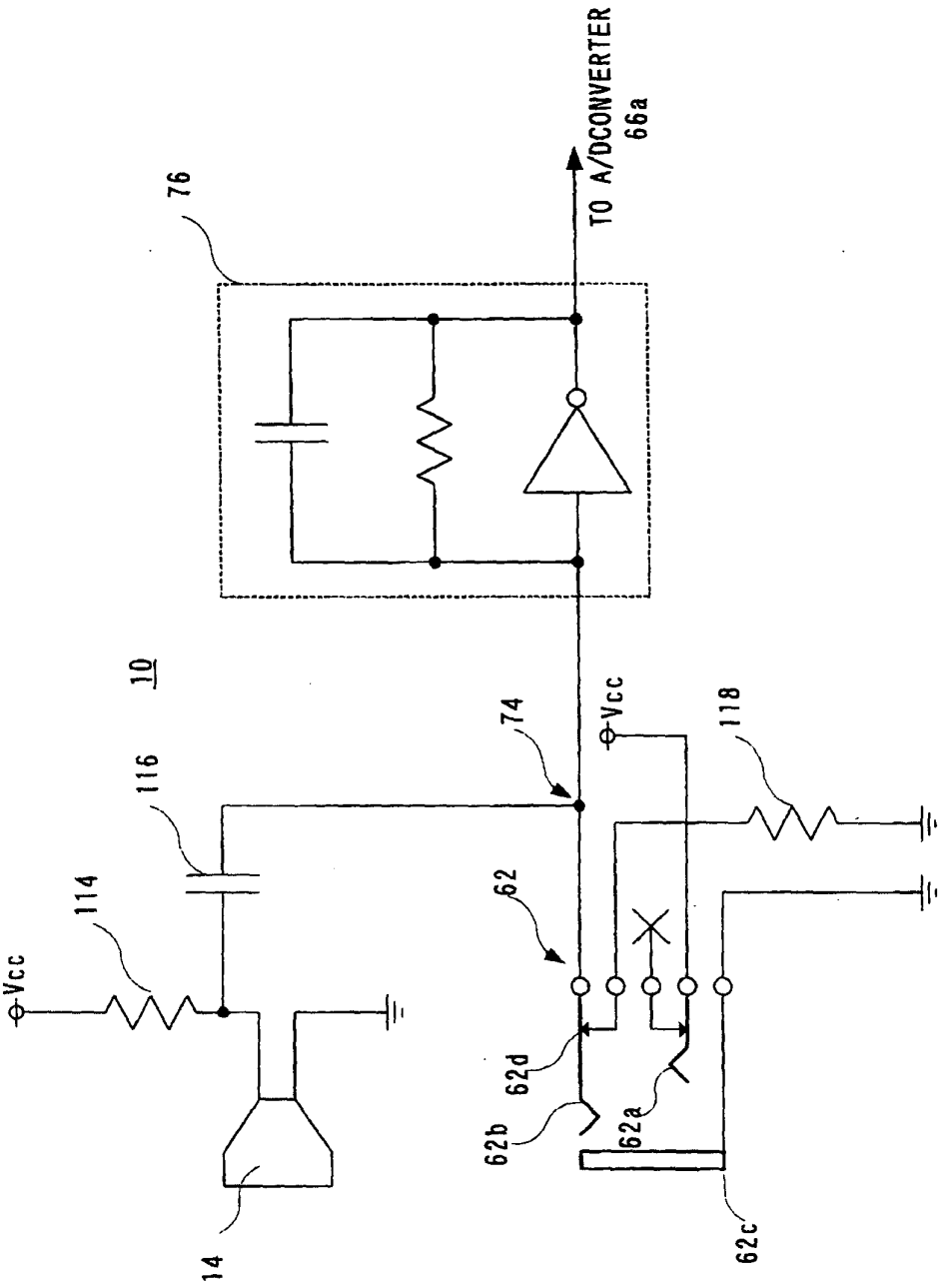

TO A/DCONVERTER
66a
76
10
74
Vcc
118
116
114
62
Vcc
62d
62b
62a
62c
14

FIG. 6

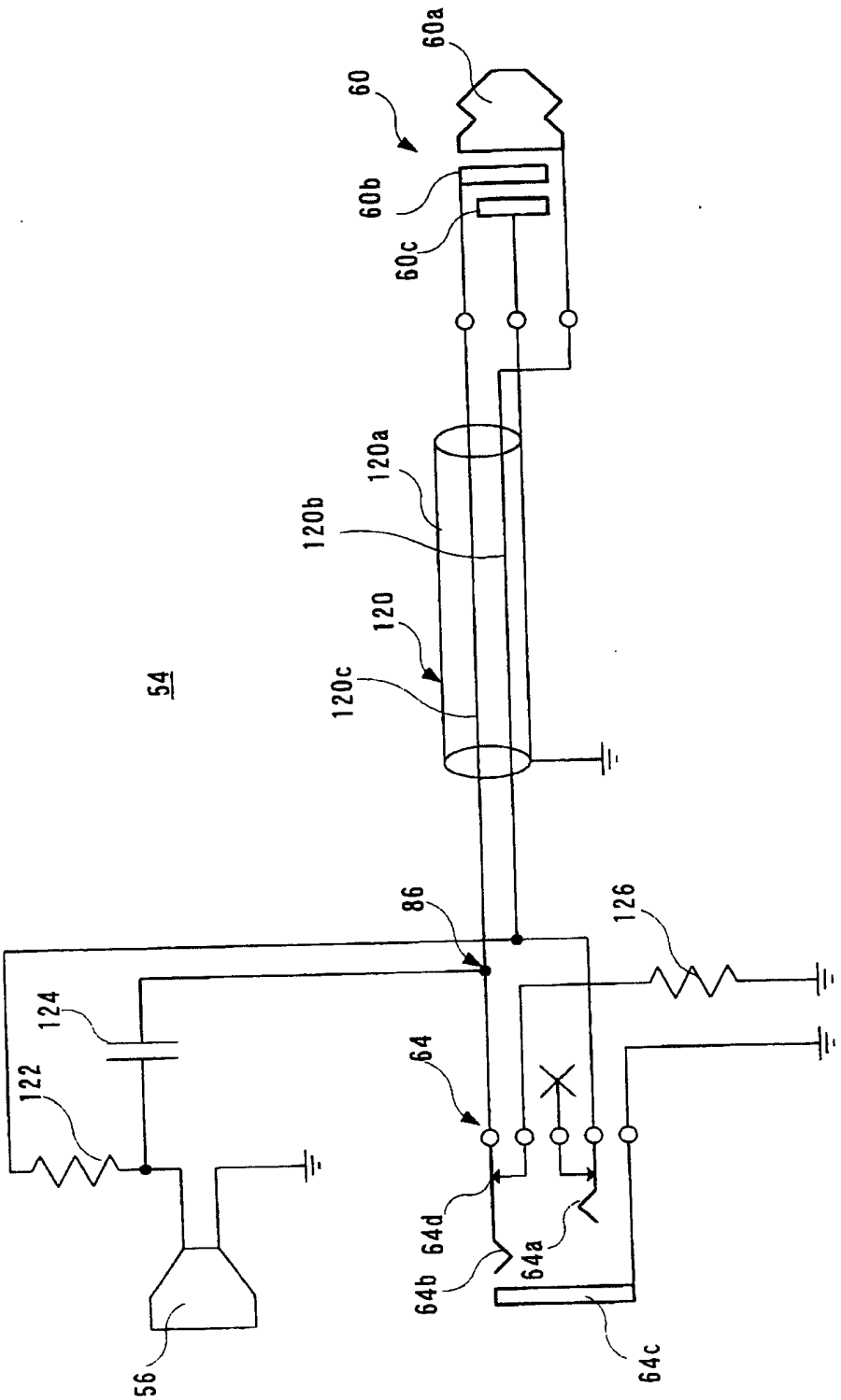

54
60
60a
60b
60c
120
120a
120b
120c
86
126
124
122
64
64a
64b
64c
64d
56

FIG. 7

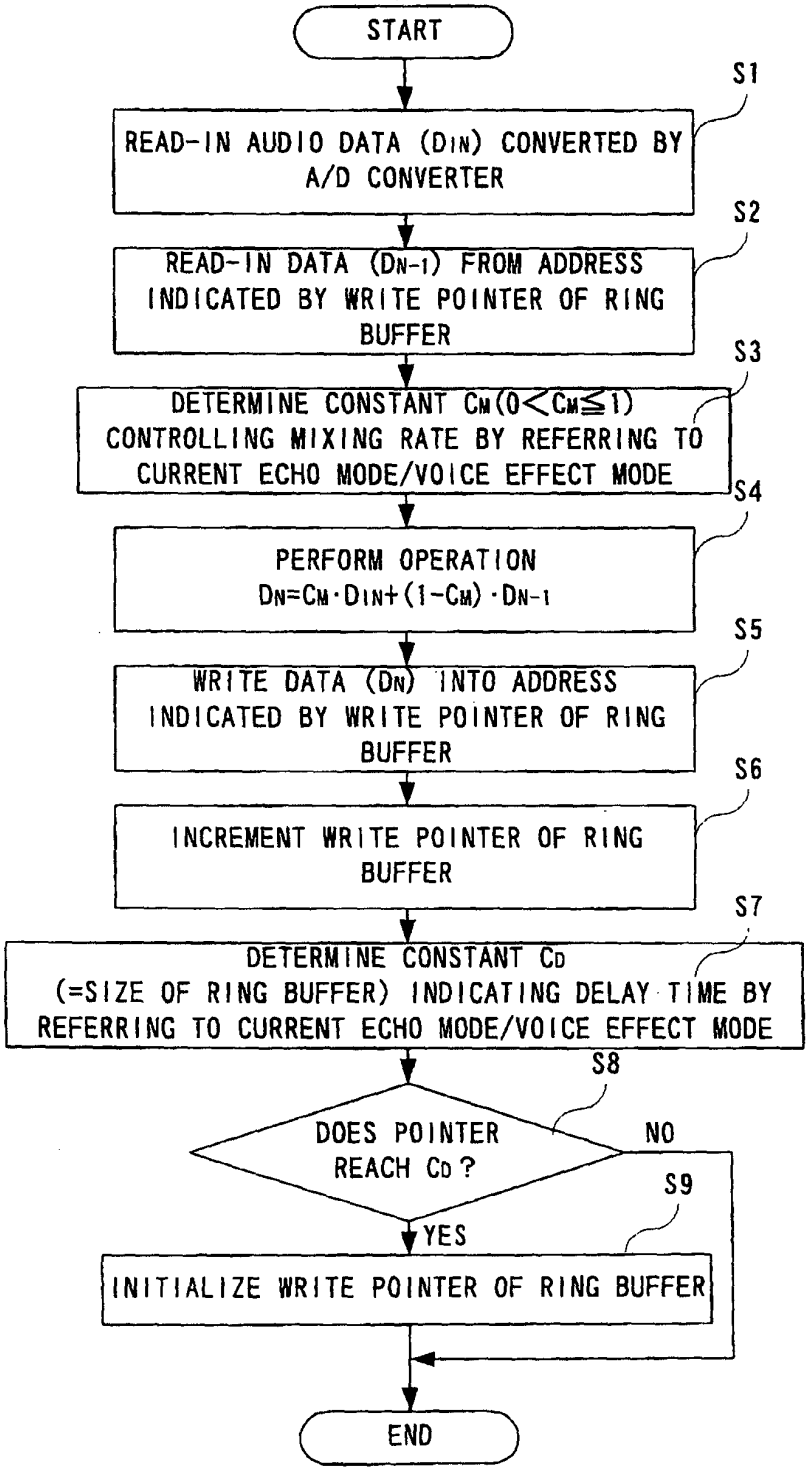

START
S1
READ-IN AUDIO DATA (D_{IN}) CONVERTED BY A/D CONVERTER
S2
READ-IN DATA (D_{N-1}) FROM ADDRESS INDICATED BY WRITE POINTER OF RING BUFFER
S3
DETERMINE CONSTANT C_M ($0 < C_M \leq 1$) CONTROLLING MIXING RATE BY REFERRING TO CURRENT ECHO MODE/VOICE EFFECT MODE
S4
PERFORM OPERATION $D_N = C_M \cdot D_{IN} + (1 - C_M) \cdot D_{N-1}$
S5
WRITE DATA (D_N) INTO ADDRESS INDICATED BY WRITE POINTER OF RING BUFFER
S6
INCREMENT WRITE POINTER OF RING BUFFER
S7
DETERMINE CONSTANT C_D (=SIZE OF RING BUFFER) INDICATING DELAY TIME BY REFERRING TO CURRENT ECHO MODE/VOICE EFFECT MODE
S8
DOES POINTER REACH C_D ?
NO
YES
S9
INITIALIZE WRITE POINTER OF RING BUFFER
END

FIG. 8

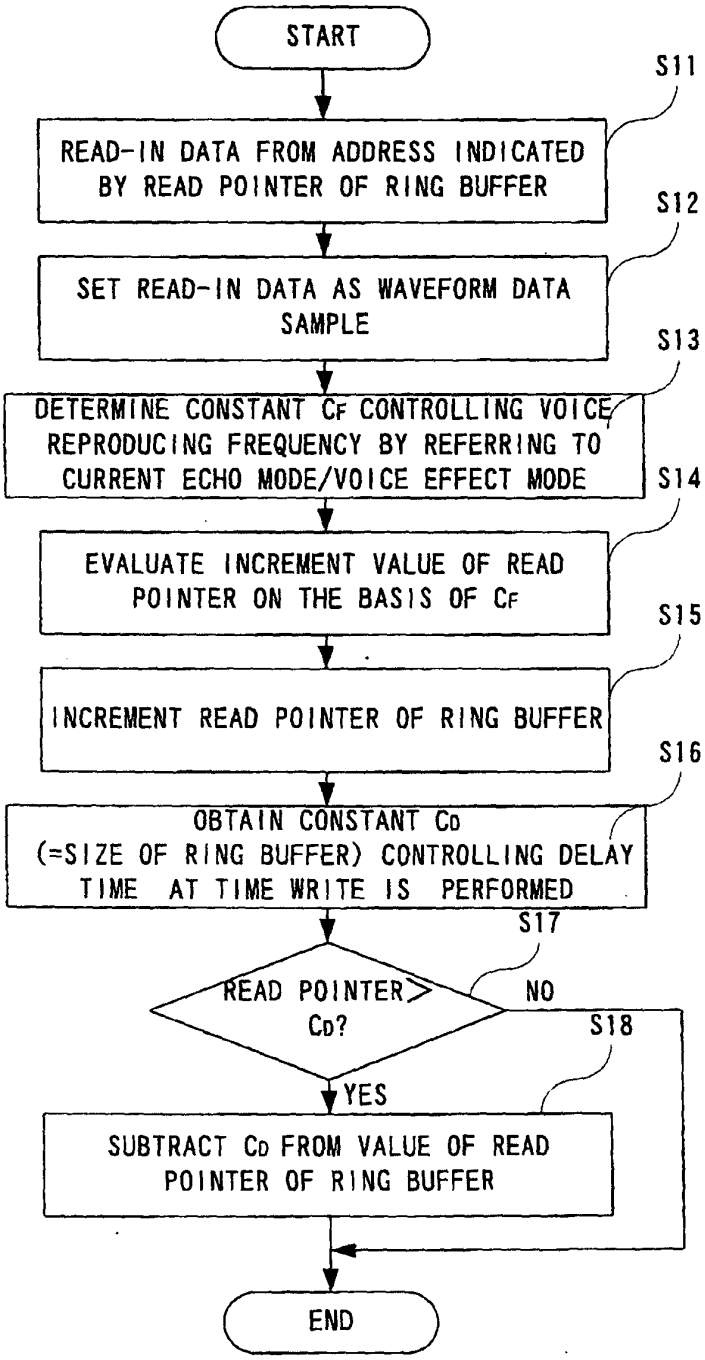
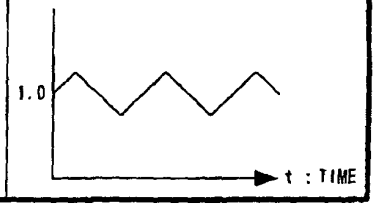

START
S11
READ-IN DATA FROM ADDRESS INDICATED BY READ POINTER OF RING BUFFER
S12
SET READ-IN DATA AS WAVEFORM DATA SAMPLE
S13
DETERMINE CONSTANT CF CONTROLLING VOICE REPRODUCING FREQUENCY BY REFERRING TO CURRENT ECHO MODE/VOICE EFFECT MODE
S14
EVALUATE INCREMENT VALUE OF READ POINTER ON THE BASIS OF CF
S15
INCREMENT READ POINTER OF RING BUFFER
S16
OBTAIN CONSTANT CD (=SIZE OF RING BUFFER) CONTROLLING DELAY TIME AT TIME WRITE IS PERFORMED
S17
READ POINTER > CD?
NO
YES
S18
SUBTRACT CD FROM VALUE OF READ POINTER OF RING BUFFER
END

FIG. 9

EXAMPLE CONSTANT TABLE OF ECHO MODE/VOICE EFFECT MODE

MODE \ CONSTANT	CONSTANT C_M CONTROLLING MIXING RATE	CONSTANT C_D CONTROLLING DELAY TIME	CONSTANT C_F CONTROLLING VOICE REPRODUCING FREQUENCY
ECHO MODE 1 (DELAY : SMALL)	0. 5 (50%)	SMALL	1. 0 (100%)
ECHO MODE 2 (DELAY : MIDDLE)	0. 5 (50%)	MIDDLE	1. 0 (100%)
ECHO MODE 3 (DELAY : LARGE)	0. 5 (50%)	LARGE	1. 0 (100%)
VOICE EFFECT MODE 1 (FREQUENCY VARIATION : HIGH-TONE)	0. 75 (75%)	MINIMUM	2. 0 (200%)
VOICE EFFECT MODE 2 (FREQUENCY VARIATION : LOW-TONE)	0. 75 (75%)	MINIMUM	0. 5 (50%)
VOICE EFFECT MODE 3 (FREQUENCY VARIATION : SWEEP)	0. 75 (75%)	MINIMUM	VARIED ALONG WITH TIME WITHIN RANGE OF $0.75 \leqq CF \leqq 1.25$